A UNIFIED TRUST MODEL FOR PERVASIVE COMPUTING ENVIRONMENT

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To my dear parents

To my beloved wife *Sanaz*

To my sweet daughter *Bahareh*

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ABSTRACT

Pervasive systems are weaving themselves in our daily life by making it possible for known and even unknown parties to collect user information invisibly and in an unobtrusive manner. The huge number of interactions between users and pervasive devices necessitate a comprehensive trust model which unifies different trust factors such as context, recommendation, and history that would be used to calculate precisely the trust level of each party. Therefore, developing a runtime and accurate trust computation would be a major issue in these environments. Measuring accurately the integrity of nodes willing to interact with each other can enhance the trust calculation process, particularly during the uncertainty state and initiation phase. Trusted computing enables effective solutions to verify the trustworthiness of computing platforms. This research aims to provide a unified and dynamic approach while considering several trust dimensions namely: history, recommendation, context, and attesting the communicating platforms to increase accuracy of trust computation mechanism. In this research, the Unified Trust Model (UTM) is proposed to calculate trustworthiness of entities based on history, recommendation, context, and platform integrity measurement (used in remote attestation). The accuracy and performance of UTM were evaluated using a simulation-based method in different experimental scenarios. A comparison of UTM with similar works showed that the accuracy of the model improved from 2% to 41.3% during an oscillating attack and from 7.4% to 26.8% during a collusion attack. The results obtained from the different simulated scenarios have demonstrated that the proposed UTM is highly accurate and can be used effectively in realistic as well as low interaction environments.

ABSTRAK

Sistem Pervasif semakin mempengaruhi hidupan harian kita, membenarkan individu untuk memungut maklumat pengguna secara sembunyi, menggunakan kaedah yang tidak menggangu sama ada melalui pihak–pihak yang dikenali atau tidak. Interaksi tidak terhingga diantara pengguna dan alat pervasive memerlukan sebuah model komprehensif yang menggambungkan pelbagai faktor amanah contohnya, konteks, rekomendasi dan latar sejarah untuk mengira tahap amanah setiap pihak secara jitu. Oleh yang demikian, suatu komputasi secara masalarian dan jitu adalah menjadi masalah besar dalam persekitaran sedemikian. Pengukuran jitu terhadap integriti nod nod yang berinteraksi dapat merangsang proses evolusi tersebut; khasnya dalam keadaan ketidaktentuan dan fasa permulaan. Trusted computing membolehkan penyelesaian efektif untuk membuktikan keamanahan (trustworthiness) sesuatu platform pengkomputeran. Penyelidikan ini adalah bertujuan untuk memberikan suatu pendekatan persatuan (unified) dan dinamik sementara mengambilkira beberapa dimensi amanah, seperti latar sejarah, rekomendasi, konteks,dan pembuktian (attesting) platfom yang berkomunikasi untuk meningkatkan kejituan mekanisma komputasi. Dalam penyelidikan ini kami mencadangkan dan membentangkan Unified Trust Model (UTM) yang mengira keamanahan entiti berdasarkan kepada latar sejarah, rekomendasi, konteks, dan pengukuran integriti platform (digunakan semasa keamanahan jarak jauh). Kejituan dan Persembahan model kami dinilai dengan menggunakan kaedah simulasi dalam pelbagai sinario ujikaji. Perbandingan diantara UTM dengan penyelidikan yang serupa, kami mendapati kejituannya dapat diperbaiki dari 2% ke 41.3% dalam suasana serangan berayun (oscillating attack), dan dari 7.4% ke 26.8% dalam serangan kolusi (collusion attack). Keputusan yang diperolehi daripada pelbagai senario simulasi menunjukkan kejituan yang tinggi daripada model yang dipersembahkan dan mempamerkan bahawa UTM dapat digunakan secara efektif dalam keadaan realistic dan juga persekitaran yang mempunyai interaksi rendah.